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Ocean Science Discussions

Interactive comment on "The relative importance of selected factors controlling the oxygen dynamics in the water column of the Baltic Sea" *by* S. Miladinova and A. Stips

S. Miladinova and A. Stips

svetla.miladinova@jrc.ec.europa.eu

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First we would like to thank the referee for her/his strong interest in the topic and her/his thoughtful proposals to improve the contents and layout of the paper. Unfortunately, despite the acknowledged improvements the referee's opinion remains that the presented material provides too little new insight to warrant publication. We would like to reply as follows:

Reply to comment 1)

Contrary to the referee's opinion, the finding that the oxygen variation is well captured using a 1-D model and mainly depends on physical factors comes for many people as

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a surprise (see the comments by Hans Burchard about the importance of biological oxygen production). And has this fact already clearly demonstrated elsewhere? Not to our knowledge and in this case we consider it as important to publish the results.

We are aware that the consideration of what is an important result is of course very much a subjective opinion, and therefore cannot be changed easily. We, for instance, thought that a variable Redfield ratio is not important for our simulations. Should we therefore consider all papers dedicated to the variable Redfield ratio as not very relevant, as it has just proved that our assumption is right?

Reply to comment 2)

The reasons why the model does not and cannot capture the near bottom oxygen dynamics specifically in the transitional area between North Sea and Baltic Sea are discussed in the paper (pages 2128/2129 and 2137)). Bottom salinity is shown for station BY5 in Fig. 6. The important role of oxygenation by inflowing salty and oxygen rich water can be clearly seen from Fig. 6. The fact that these (seasonal) inflows are causing the large oxygen variations is seemed obvious to us. It also becomes clear from Figure 6 that the introduction of an improved (even correct) sediment oxygen demand would result in a continuous decrease of bottom oxygen, if no seasonal advective oxygen transport has been included. Therefore, we have concluded that the problem of capturing the bottom oxygen dynamics cannot be really solved in a 1-D modeling framework.

Reply to the additional comment 23.10.2009 (3)

An assumed constant flux of oxygen into the deep Baltic is certainly a new hypothesis. Such an assumed flux could not be driven by inflowing salty water from the North Sea, because of the intermittent character of theses pulses, which show prevalence to winter inflow. Therefore it seems to us much more likely that bottom oxygen is always decreasing right after the appearance of an inflow until the next inflow occurs. Further, there is a seasonal deepening of the mixed layer, but due to the very strong vertical

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density gradient which is maintained by the horizontal buoyancy flux this deepening process is not reaching the bottom in this area. The usually picture accepted for the Baltic entrance area, which is also confirmed by the bottom salinity time series (not shown), is that new oxygen is advected laterally and consumed locally by the bottom sediments (mud).

In summary, if the referee considers this point as so important to be clarified and included as an additional subsection, this could be done.

Reply to the specific comments.

Particularly, Fig. 9 is indeed of less relevance. However, showing the discrepancy between the measured data sets helps us to put the discrepancies between simulated chlorophyll and measured chlorophyll into a reference frame. The meaning of “mean absolute error” and “root mean square difference” will be explained as well as the minimum turbulent kinetic energy K_min.

Interactive comment on Ocean Sci. Discuss., 6, 2115, 2009.